

Guidelines for Hillside and SlopedSite Development In Mixed-Use Districts

JANUARY 2019

CITY PLANNING



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Introduction

The Need

Raleigh has seen significant development activity over the past 10 years, particularly multi-family and student housing projects in mixed-use zoning districts. The Unified Development Ordinance places emphasis on build-to lines, transparency, and active use at street level. The City routinely receives development plans for sloping sites; some of which take a stark approach to the interface between the building façade and the public sidewalk. Meeting the regulations of the UDO may present challenges to projects where significant topography exists across a relatively small area. In other cases however, projects may assemble multiple parcels across seemingly flat sites, where the size of the development reveals an unexpected change in grade.

Based on recent development plan approvals and built projects, Raleigh has concluded that its existing development regulations do not adequately address the unique conditions of sloping sites. This has created somewhat undesirable conditions related to building height, transitions, retaining walls at property edges, public realm quality and safety, and lack of pedestrian and vehicular connectivity between sites in some circumstances. Staff has had little flexibility in applying existing design guideline standards to development projects on sloping sites during both the site plan review process and Administrative Alternate process. The lack of clarity and flexibility has led to unintended consequences and undesirable development outcomes.

The Process

In the fall of 2017 the City engaged in a contract with Code Studio, LLC, to complete a Best Practices for Hillside and Sloped Site Development Manual. This project will result in recommendations for policy guidance and regulatory code.

The consultant team traveled to Raleigh for three days of field research and stakeholder meetings. The team documented developments throughout Raleigh and evaluated what elements made their relationship to the street and public realm successful or unsuccessful. Meetings were held with members of the Development Management Team, the Appearance Commission, and the Planning Commission. The intent of the meetings was to use the stakeholders' expertise to assist in clarifying the problem, identifying key issues and, if possible, prioritizing areas of needed reform.

The team reviewed the existing policies of Comprehensive Plan, the regulations of the UDO, and any applicable City guidelines to understand specifically whether the key issues can be resolved using existing policy, regulations and guidelines, and if not, what types of new tools are needed.

Working with City staff, the team identified appropriate peer cities, and then inventory best practices with regard to the key issues raised during the earlier tasks. The selection of peer cities reflected local urban and suburban conditions in Raleigh.

Based on the information gathered from field research observations, policy audit, stakeholder feedback, and peer city research, the team gathered areas of focus to perform

3D-modeling scenarios in order to test potential code changes.

The results of the modeling and testing have been used to set the framework for amendments to existing City policy and regulations. A series of draft amendments have been prepared by the team. Proposed modifications to the UDO are explained and outlined in this document.

Upon completion of a public commenting period, amendments or edits, if necessary will be made to the proposed text changes by City Staff. Text changes will be presented to City Council for adoption.

The Desired Outcome

The goal of the study is to further promote good urban form and connectivity, activate public streets, and minimize stark building techniques for sloped properties in urban and suburban mixed-use districts. The proposed changes to the UDO will have a positive impact to the public realm while also providing flexibility and predictability for the development community



Issues to Address

Based on field research and staff input, the team identified issues that merited technical study:

- 1. **Measurement of Height** Establish a method for measuring height of a building that accounts for slope changes throughout the site so that all structures conform to the zoned story limit.
- 2. **Pedestrian Access** Promote pedestrian accessibility by setting forth regulations regarding access both directly and through a retaining wall.
- 3. **Neighborhood Transitions** Mitigate impact between otherwise incompatible adjacent land uses by standardizing height measurement where a retaining wall exists in the transition zone.
- 4. **Transparency & Blank Wall** Determine methods to accurately measure transparency where a slope exists and mitigate the impact of foundation walls on the pedestrian experience.
- 5. **Retaining Walls** Create retaining wall regulations to ensure final products are not excessively tall and overbearing on adjacent sidewalks or properties.
- 6. **Frontage** Update the UDO Frontage descriptions so as to differentiate between decorative and active frontages.

2 Measurement of Height

Original UDO Method:

The original UDO text determined height by measuring from the average grade to the top of roof. The average grade is determined by calculating the average of the highest and lowest elevation points along the front face of the building only (1).

When a site slopes downhill from the street, additional height of the structure at the rear does not change the height measurement from the primary street. One additional story than what is allowed may be built on the lower portion of the site (downhill from the street). When a site slopes uphill from the street, height is measured from the average point of grade between the front and rear wall plane

Challenges:

The original language does not address height limits for a building's side or rear facades. This can create unpredictable height results on secondary streets or for adjacent rear and side lot properties.

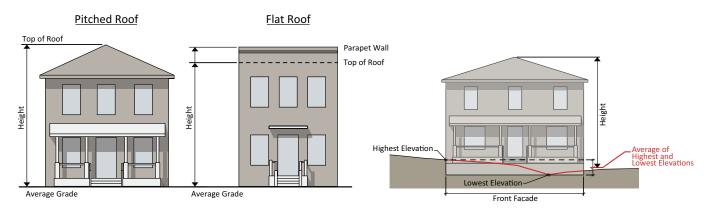
The additional floor that can be gained when a site slopes away from the primary street was conceived as a basement-like condition (2). This allowance has been used creatively to carve out additional above grade areas at the sidewalk level, that are technically classified as basements. The result can be a building where the number of visible stories from the street exceeds the zoned story limit.

Text Change 17-16 (Average Grade, Basement Definition):

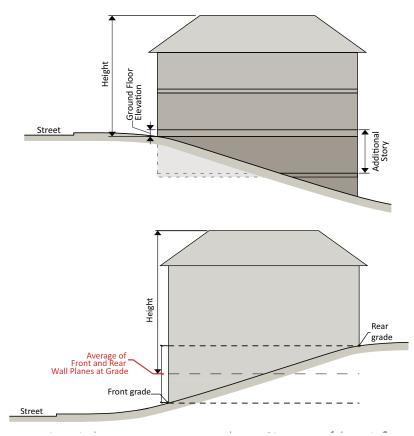
In order to address the creation of additional above ground floor area that is classified as a basement, a text change was moved in advance of this study. TC-17-16 makes several changes to the code:

- Sets the method for determining average grade by calculating the average of the highest and lowest elevation along each building elevation, and averaging all elevations.
- Gaining an additional story when a site slopes away from the primary street is limited to buildings three stories or lower and any buildings in the Downtown Mixed-Use District. This provision only applies when a building does not contain a basement.

This text change was adopted July 3, 2018 and goes into effect September 1,



1. Original UDO Height Measurement



2. Original UDO Method of Sloped Site Height Measurement

Proposed Text Changes:

This study incorporates the change to determining average grade, as defined in TC-17-16, however, proposes that the TC-17-16 method is one of two methods that can be used to determine average grade. Using a single average grade for a building footprint, as TC-17-16 proposes, is likely the desired method on flat or slightly sloped site. Where there is significant slope, or a site is large enough that a moderate slope has significant impact on building design, a more gradated approach may be warranted. These two options, the Single Module Method and Multiple Module Method, are described here.

Why have two methods for determining the height of a building?

Creating two methods for establishing height is based on several factors.

First, the method of creating multi-family housing today is very different than it was 100 years ago, when many cities were urbanizing like Raleigh is today. At that time, large city blocks would be filled with separate buildings, side by side, lining the streets. These separate buildings would share a wall (known as party wall), but have their own entries and exits, and internal circulation. So in a condition where the street sloped, these individual buildings would simply step down with the topography (3).

Today's development takes a different form than that historic model. To begin, many buildings today are simply larger in scale and density, and most developers will assemble several parcels of land to make a 4, 5, or 7-story building feasible. Instead of breaking a site up into multiple separate buildings, sites are developed with large buildings containing double and single-loaded corridors. Buildings of this size also require a significant amount of parking, sometimes as surface parking but many times in large, bulky parking decks. Often, these decks are wrapped on the exterior with apartments. Stepping a large building to meet topography becomes challenging when continuous floor levels are desired throughout (4).



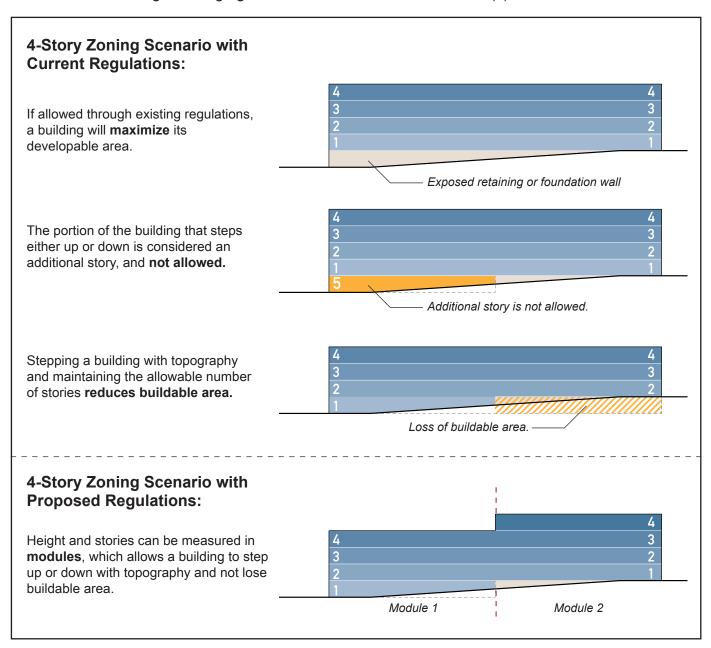


3. Historic urban development



4. Today's approach

Finally, our zoning regulates height and number of allowable stories, but not density. Developers are incentivized to maximize their allowed buildable area through height and stories. For this reason, a building is unlikely to step up or down with the topography of the site if height and stories are measured at a single average grade line for reasons outlined below (5):



5. Developable area on sloped sites

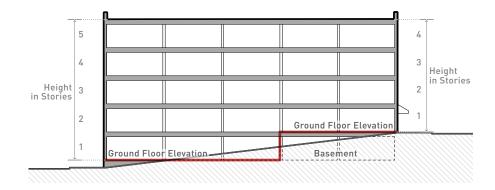
Defining Measurement of Height for Building Façade

Building Height in FEET is measured from average grade in feet to the top of the highest point of a pitched or flat roof (6).

Building Height in STORIES is measured from ground floor elevation to the top of the highest story above ground floor (7).



6. Measuring Building Height in Feet



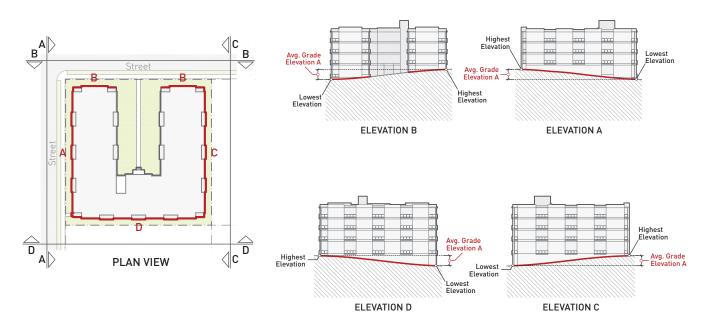
7. Measuring Building Height in Stories

Determining Average Grade for a Building Elevation

Average grade for an individual building façade elevation is determined by averaging the highest and lowest elevation along pre-development or improved grade (whichever is more restrictive) along the base of each building façade elevation (8).

Where grading has been approved by the City, average grade is calculated from the improved grade following the approval of a land disturbance permit for grading.

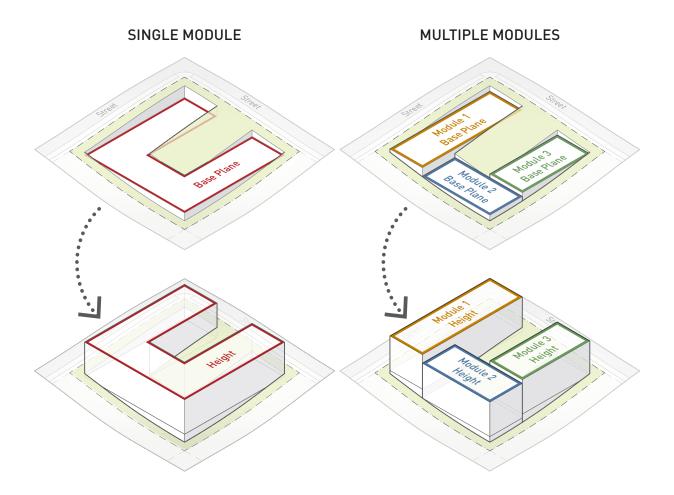
Average grade is used for determining base plane in the next section.



8. Determining Average Grade for an Elevation

Choosing a Method for Establishing Base Plane and Measuring Height

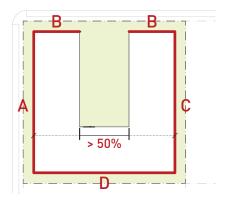
Two options are available for establishing base plan and measuring height: using a single module or using multiple modules. These methods are detailed below (9).



9. Overview of Single vs Multiple Module Methods

Applicable Building Facades:

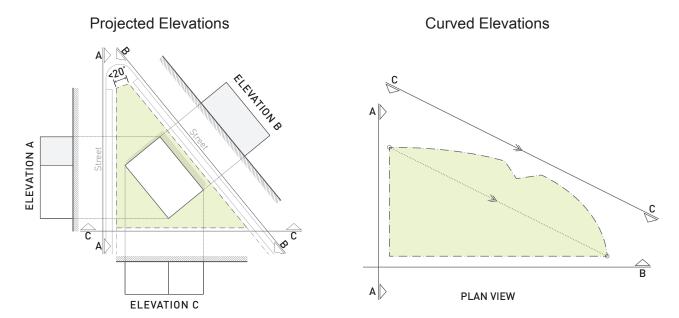
Building facades along the building perimeter that are visible from the required facade elevation (10).



10. Applicable Building Facades

Applicable Building Elevations:

Building evelvations are projected parallel to each property line greater than 20 feet long. Building elevations along curved or complex property lines are projected parallel to a line connecting the end points of the curved or complex property line (11).

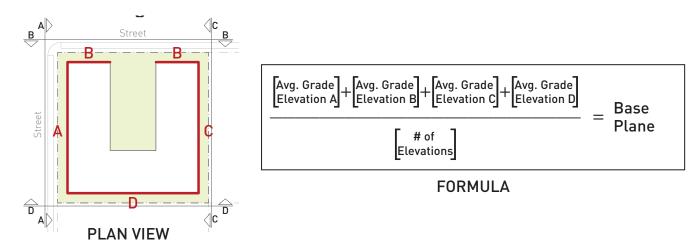


11. Appliacable Building Elevations

Single Module Method:

Average grade for the Single Module Method is determined by calculating the average grade for each applicable building façade individually of a single building footprint, then averaging the average grade for all façade elevations (12).

Measurement of height will be taken from this overall average elevation, or base plane.



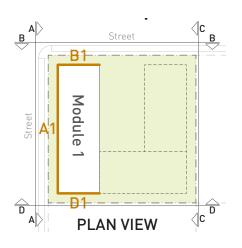
12. Single Module Method

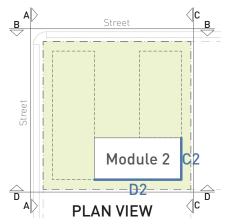
Multiple Module Method:

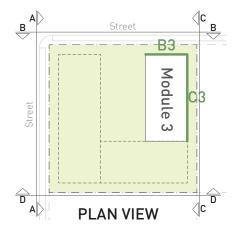
Average grade for the Multiple Module Method is determined by calculating the average grade for each applicable building façade individually for each module of a building footprint, then averaging the average grade for all façade elevations per module (13).

Measurement of height will be taken from each building module's average grade.

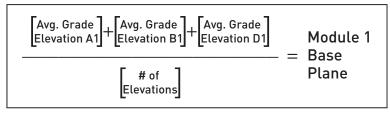
There is no determination for how many modules should be established for any given development; that decision is left to the applicant. This method is intended to give flexibility while achieving high quality design results.



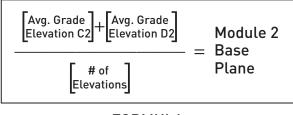




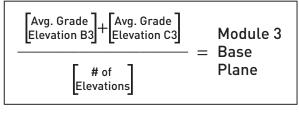
13. Multiple Module Method



FORMULA



FORMULA

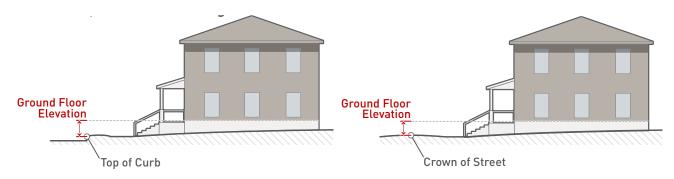


FORMULA

Ground Floor Elevation:

Changes made to ground floor elevation regulations are intended to encourage ground floors to follow topography along sidewalks.

Ground floor elevation is measured from the average sidewalk level along the adjoining street frontage, or if no sidewalk exists, the average level of the center crown of the street for the adjoining street frontage to the top of the finished ground floor (14).



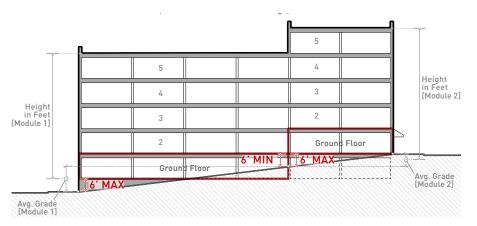
14. Ground Floor Elevation

The elevation of a finished ground floor must not be greater than 6 feet above finished grade for any portion of the building perimeter (15).



15. Establishing ground floor

A higher or lower floor may be designated as the ground story for different portions of a building façade. A ground story must be exposed above grade at least 6 feet for all portions of the building perimeter (16).



16. Establishing ground floor

Pedestrian Access

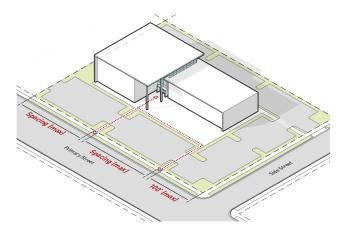
Raleigh continues to make increased investment in public transit and efforts to promote alternate forms of transit throughout the city. With this in mind, we must further prioritize adequate pedestrian connectivity to the public sidewalk. How connectivity is achieved is tailored to urban and suburban conditions.

Pedestrian Accessways

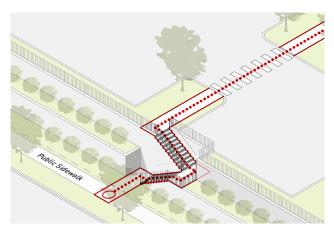
Pedestrian accessways connect the public sidewalk to the primary entrance of the principal building. They must be a minimum of 5 feet wide, unless Frontage requires wider. Pedestrian accessways must be physically separated from vehicular traffic, except where required to cross a drive aisle. On corner lots, primary pedestrian accessways must connect

to the primary street public sidewalk within 100 feet of the right-of-way of the intersecting street. Additionally, accessway spacing requirements must be met for the length of each street frontage, but do not apply to adjacent lots. Specific regulations are identified in Base Dimension Standards and Frontage Requirements portion of the UDO (17).

Where a retaining wall is allowed between the street-facing entrance and the public sidewalk, the pedestrian accessway must continue through the retaining wall. Stairs must meet standards shown (18).



17. Pedestrian access spacing

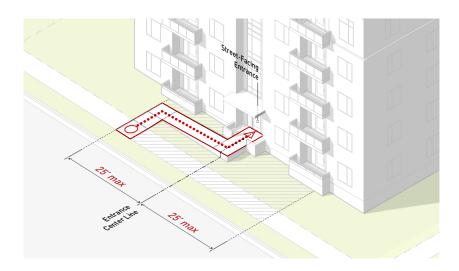


18. Pedestrian access through a retaining wall

Direct Pedestrian Access

Where required, direct pedestrian accessways must comply with the Pedestrian Accessway regulations described above. Additionally, they must connect a street facing entrance to the public sidewalk adjacent to the street the entry is facing. Direct Pedestrian Accessways should connect in the shortest distance possible, however, alternate configurations are allowed within 25 feet of the street facing entrance. Specific regulations are identified in Base Dimension Standards and Frontage Requirements portion of the UDO (19).

*Administrative Alternates are available for Pedestrian Accessways.



19. Direct Pedestrian Accessway

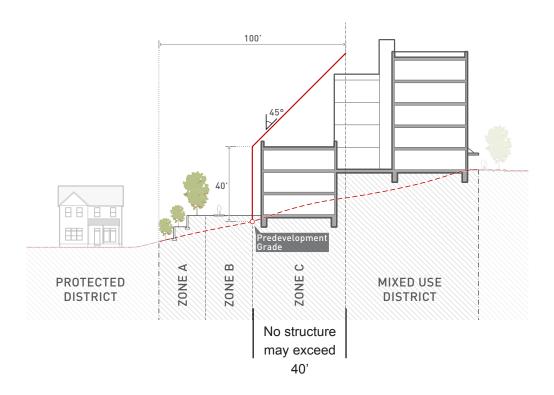
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Neighborhood Transitions

The UDO provides guidance on neighborhood transition areas to mitigate impacts between otherwise imcompatible adjacent and nearby land uses. Zone C refers to the parcels immediately abutting a mixed use district. Restrictions in this zone are intended to decrease the impact of new multi-story structures on the neighboring residential district. Currently, the UDO measures limits height in Zone C to a maximum of 40', but this may be measured from the top of a retaining wall should there be one in the zone. This results in a structure in the transition zone that has more impact on the residential district.

Measuring Height in a Transition Zone

No structure can be more than 40 feet at the Zone C line. Height can increase subject to a 45 degree height plane measured from a height of 40 feet from predevelopment grade at the Zone C line, extending upward one foot for every additional foot of setback into the site (20).



20. Measuring Height in a Transition Zone

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Transparency & Blank Wall

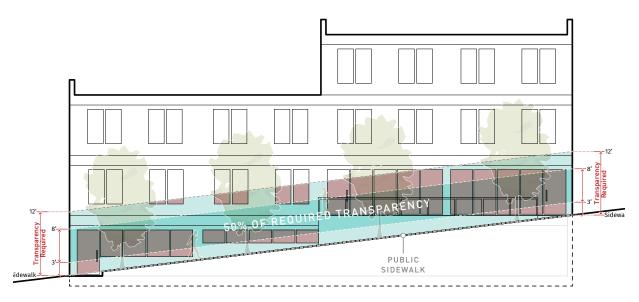
The transparency requirements are intended to lend visual interest to street-facing building facades for both pedestrians and building occupants and minimize blank walls.

Current Method and Challenges

In the current form on the UDO, transparency requirements are measured between 0 and 12 feet from the adjacent sidewalk. The intent is to make sure transparency is adequately provided to pedestrians.

This method is awkward for both designers and staff to evaluate, particularly if the

sidewalk slopes. Because the measurement follows topography, arbitrary lines on a building elevation are established to meet the requirements. Too often on sloped sites, designers are forced to apply idiosyncratic strategies to maintain transparency, or opt to seek an Administrative Alternate (21).



21. Current Method - Transparency

Proposed Changes to Transparency Measurement

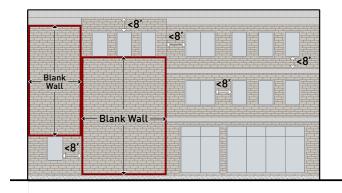
The minimum percentage of windows and doors that must cover a ground story façade is measured between 0 and 12 feet above the surface of the finished ground floor for all above grade portions of a façade (22).



22. Proposed Method - Transparency

Blank Wall

Blank Wall area has been updated to include any portion of the wall greater that 8 feet in height AND width, as well as foundation wall area (23).



23. Blank Wall Definition

Blank Foundation Wall

Exposed foundation walls are an inevitable part of building on topography. The goal of these regulations is to minimize stark building treatments at or near the street level. These regulations only apply when exposed foundation walls are within 55 feet of the right-of-way.

Any section of a foundation wall exposed more than 4 feet above grade must apply one of the following treatments to a minimum of 75% of the length of the blank wall section. The treatments may be used individually or combined, and may be applied in a contiguous or separated strategy, as long as 75% coverage is maintained (24):

- Seating
- Planter
- Green Wall
- Pedestrian Access
- Seating

Foundation Planting



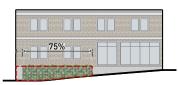
A 3' tall shrub planted at a rate of 3 shrubs per 10 feet of otherwise blank foundation wall.

<u>Planter</u>



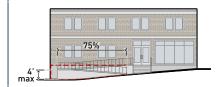
A planter of not more than 4 feet in height above the sidewalk that reveals a maximum of 2 feet of foundation wall.

Green Wall



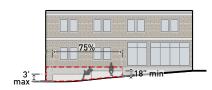
A structure permanently attached to the applicable wall and at least 75% covered in vegetation. Includes both systems providing support for climbing plants and systems supporting vegetation with its own growing medium.

Access



Stairs or ramps providing access to a street-facing entrance. Must be no more than 4 feet in height above the sidewalk.

Seating



A permanent structure intended for public seating between 18 inches and 3 feet in height above the sidewalk, and a minimum of 18 inches deep.

24. Blank Foundation Wall Treatments

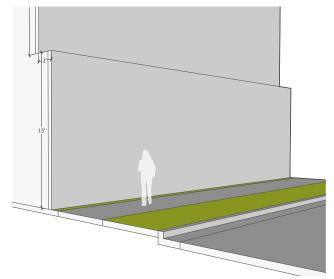
6 Retaining Walls

Current Regulations & Challenges

Retaining walls are limited to 15 feet in height. Additional height is permitted if a 2-foot step back is provided in-between 15-foot high sections. These regulations only apply when a retaining wall is within 30 feet of a public sidewalk.

These regulations do not apply to walls associated with culverts or stream crossing or to transportation improvements.

The current regulations are simply too permissive and have resulted in excessively tall and overbearing retaining walls adjacent to public sidewalks or neighboring property lines (25).



25. Current Retaining Wall Regulations

Proposed Guidelines

Negotiating a moderate or significant slope with thoughtful design strategies is needed to ensure a high quality of public and private spaces is maintained. The height limit for a retaining wall is currently too high, and setback distances between walls is not adequate. A new section for retaining walls is proposed for the UDO that addresses:

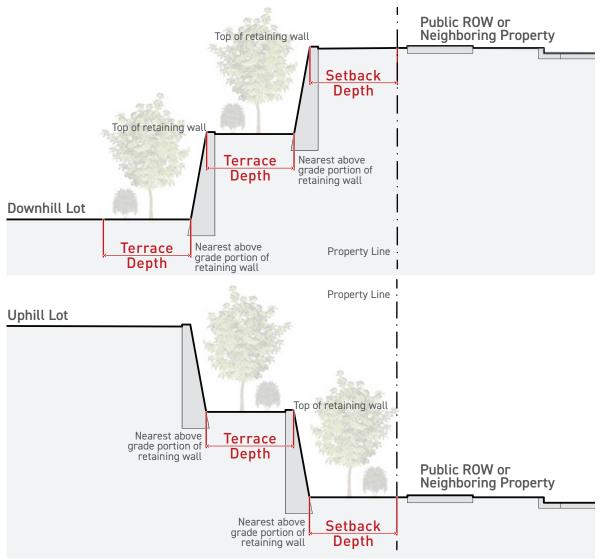
- 1. Setback and Terrace Depth
- 2. Retaining Wall Height
- 3. Planting requirements

In the proposed changes, height of a retaining wall corresponds to a required setback distance, terrace distance, and planting minimum. Setback and terrace width increases as retaining wall height increases. Planting requirements in the form of size, quantity, and type correspond with setback and terrace depth. Additionally, a seat wall, in lieu of a setback, exception is provided. Maximum height of a retaining wall is limited to 8 feet.

Measurement of Setback and Terrace Depth

Setback depth is measured from the above-grade portion of a retaining wall to the property line, sidewalk or access drive nearest to the retaining wall.

Terrace depth is measured from the top of the outside face of a retaining wall to the nearest above grade portion of the next higher retaining wall (26).



26. Proposed Measurement of Setback and Terrace Depth

Measurement of Retaining Wall Height

Retaining wall height is measured from an adjacent sidewalk to the top of a retaining wall. Where no sidewalk exists within 20 feet of a retaining wall, retaining wall height is measured from grade at the base of the retaining wall (27).

Each next higher retaining wall in a tiered retaining wall system is measured from the top of the lower wall to the top of the higher wall (28).

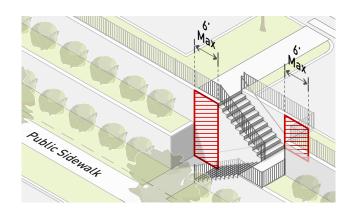
A section of retaining wall up to 6 feet wide may extend to a maximum height of 16 feet in height only in conjunction with a staircase landing or ramp landing providing pedestrian access through a retaining wall (29).



27. Measuring Retaining Wall Height



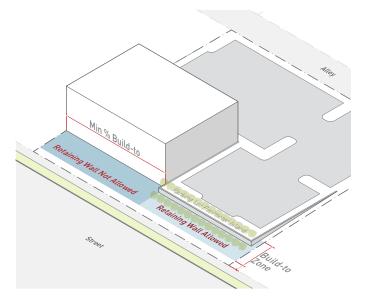
28. Measuring Retaining Wall Height



29. Measuring a Retaining Wall that Contains a Staircase

Retaining walls are allowed between the building and the street in all Residential and Special Districts. Where a frontage does not allow retaining walls between the building and the street, retaining walls are always allowed under the following conditions:

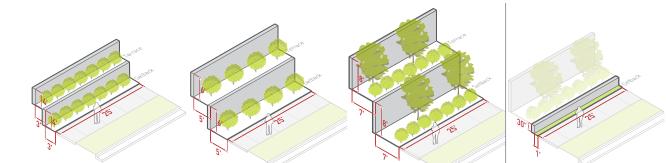
- 1.In the build-to zone once the required minimum percentage build-to has been met (30).
- 2.Between the building and the street where the building face is not required to meet the minimum percentage build-to.
- 3. Where no retaining wall is allowed between a building and the street, a planter or garden wall with a wall height of up to 4 feet is allowed.



30. Retaining wall in the build-to zone

Retaining Wall Standards

Multiple individual retaining walls meeting the requirements of the table below may be combined to form a tiered retaining wall system.

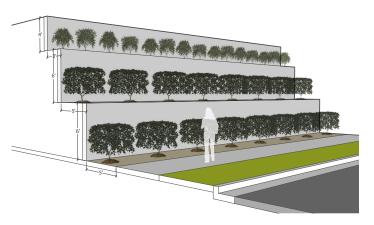


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Individual Retaining Wall Height	0 to 4'	Over 4' to 6'	Over 6' to 8'	Seatwall Exception Up to 30"
Terrace/Setback Depth (min)	3'	5'	7'	1'
Understory Tree (min per 100')	Not required	Not required	8	Not required
Shrubs (min per 100')	30	15	30	Not required
Shrub height (min)	3'	5'	3'	n/a
		-		

* Only allowed at grade

- 1. The height of an individual retaining wall must not exceed 8 feet for any portion of its length.
- 2. Vegetation planting must follow the requirements in the table above and comply with Sec. 7.2.7. Design and Installation.





Two acceptable strategies for a 16' tall retaining wall

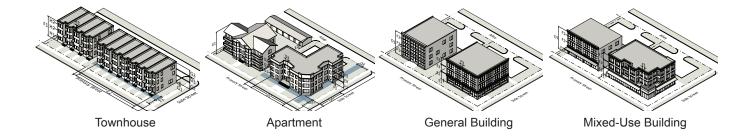
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Base Dimensional Standards & Frontage Requirements

Frontages link a desired development pattern with specific form requirements that mandate the type of development desired along the street edge. Frontages place different requirements from the Base Dimensional Standards. Where there is a conflict between the base dimensional standards and the frontage requirements, the frontage requirements control.

Pedestrian Access and Retaining Walls are the two categories that have different requirements with respect to Base Dimensional Standards (31) and Frontages (32). Proposed guidelines are indicated in this section.

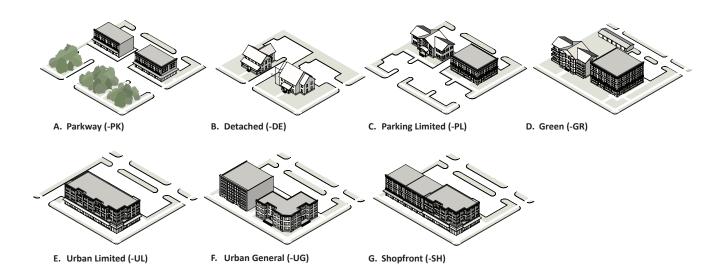
Base Dimensional Standards



Base Dimensional	Pedestrian Access				
Standards	Primary Street Entrance	Direct Pedestrian Accessway	Pedestrian Accessway Spacing		
Townhouse	1 per unit in build-to zone	1 per street frontage	100'		
Apartment	1 per unit in build-to zone	1 per street frontage	100'		
General Building	1 per principal building	1 per street frontage	300'		
Mixed-Use Building	1 per principal building	1 per street frontage	300'		

31. Base Dimensional Standards - Pedestrian Access

Frontage Type



	Pedestrian Access					Retaining Wall	
Frontage Type	Pedestrian Accessway Required	Pedestrian Accessway Spacing	Width of Pedestrian Accessway (min/max)	Primary Street- facing entrance required	Street-facing entrance spacing (max)	Direct pedestrian accessway required	Between Building and Street
Parkway (-PK)	1 per street frontage (min)	300 feet*	10 feet /20 feet*	-	-	-	Allowed
Detached (-DE)	-	-	3 feet	1 per principal building (min)	75 feet	All required street facing entrances	Allowed
Parking Limited (-PL)	1 per street frontage	300 feet	-	1 per principal building in build- to zone (min)	-	-	Allowed
Green (-GR)	-	-	-	1 per principal building in build- to zone (min)	100 feet*	All required street facing entrances	Not Allowed
Urban Limited (-UL)	-	-	-	Yes*	75 feet*	1 per required street facing entrance	Not Allowed
Urban General (-UG)	-	-	-	Yes*	75 feet*	1 per required street facing entrance	Not Allowed
Shopfront (-SH)	-	-	-	Yes*	50 feet*	1 per required street facing entrance	Not Allowed

32. Frontage - Pedestrian Access and Retaining Walls

^{*}Requirements currently adopted in the UDO.

Adopting into the UDO

Next Steps

Proposed concepts outlined in this document will go through the following process before final adoption into the UDO.

- Guidelines for Hillside / Sloped-Site Development is Mixed-Use Districts will be made available for a 30-day Public Comment period
- Public Meeting Q&A
- Text Change review and recommendations by the Planning Commission
- Review and Adoption by City Council

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Guidelines for Hillside and SlopedSite Development In Mixed-Use Districts

JANUARY 2019

CITY PLANNING

For more information please contact Planning staff at 919-996-2682 or visit raleighnc.gov/planning

